CLAIMS

1. A voltage generation circuit, comprising:

a generator circuit adapted to receive a supply voltage and including a reference node, the generator circuit developing an output voltage from the supply voltage and the output voltage having a value that is a function of a reference voltage applied on the reference node;

a coupling circuit coupled to the reference node and adapted to receive the supply voltage, the coupling circuit being operable in response to a voltage control signal to vary an electronic coupling of the supply voltage to the reference node and thereby adjust the value of the reference voltage; and

a voltage sensing circuit coupled to the reference node to receive the reference voltage and coupled to the coupling circuit, the voltage sensing circuit developing the voltage control signal responsive to the reference voltage.

2. The voltage generation circuit of claim 1 wherein the generator circuit develops as the output voltage a pumped output voltage having a value greater than the supply voltage.

3. The voltage generation circuit of claim 1 wherein the voltage sensing circuit decreases a value of the voltage control signal when the reference voltage increases and increases a value of the voltage control signal when the reference voltage decreases.

4. The voltage generation circuit of claim 3 wherein the voltage sensing circuit comprises:

a first transistor having a first signal terminal coupled to source of the supply voltage and having a second signal terminal and a control terminal coupled to the reference node;

a level shifting circuit having a first terminal coupled to the second signal terminal of the first transistor and having a second signal terminal, the level shifting circuit developing a voltage on the second terminal having a value that s a function of the voltage on the first terminal;

a first current source coupled between the second terminal of the level shifting circuit and a common reference voltage source;

a second transistor having a control terminal coupled to the second terminal of the level shifting circuit and having a first signal terminal coupled to the common reference voltage source and having a second signal terminal on which the voltage control signal is developed; and

a second current source coupled between the source of the supply voltage and the second signal terminal.

5. The voltage generation circuit of claim 1 wherein the coupling circuit reduces the electronic coupling of the supply voltage to the reference node responsive to a value of the voltage control signal increasing and increases the electronic coupling of the supply voltage to the reference node responsive to the value of the voltage control signal decreasing.

6. The voltage generation circuit of claim 5 wherein the coupling circuit comprises:

a level shifting circuit having a first terminal coupled to a source of the supply voltage and having a second terminal, the level shifting circuit developing a voltage on a second terminal having a value that is a function of the supply voltage;

a transistor having a first signal terminal coupled to the reference node and a second signal terminal coupled to the second terminal of the level shifting circuit, the transistor having a control terminal coupled to the voltage sensing circuit to receive the voltage control signal; and

a current source coupled between the reference node and a common voltage reference source.

7. The voltage generation circuit of claim 1 wherein the generator circuit further comprises:

a charge pump circuit that develops a pumped output voltage on an output responsive to a clock signal;

an oscillator circuit coupled to the charge pump, the oscillator developing a clock signal in response to an applied control signal being active and not developing the control signal in response to the applied control signal being inactive;

a feedback circuit coupled to the output of charge pump circuit to receive the pumped output voltage, the feedback circuit developing a pumped voltage having a value that is a function of the pumped output voltage; and

a comparator circuit coupled to the oscillator circuit and having a first input coupled to the feedback circuit to receive the pumped voltage and a second input adapted to receive the reference voltage, the comparator circuit applying the active control signal to the oscillator circuit when the pumped voltage is less than the reference voltage and applying the inactive control signal to the oscillator when the pumped voltage is greater than the reference voltage.

8. A voltage generation circuit, comprising:

a voltage pump circuit including a reference node and a pump feedback node, the voltage pump circuit developing on an output node an output voltage having a value that is a function of a reference voltage applied on the reference node and a feedback voltage on the feedback node;

a feedback circuit coupled between the output node and the pump feedback node of the voltage pump circuit, the feedback circuit developing the pump feedback voltage in response to the output voltage;

a coupling circuit coupled to the reference node and being adapted to receive a supply voltage and a control signal, the coupling circuit operable in response the control signal to control the value of a current supplied from the supply voltage to control the value of the reference voltage; and

a voltage sensing circuit coupled to the reference node to receive the reference voltage and coupled to the coupling circuit, the voltage sensing circuit developing the control signal responsive to the reference voltage.

9. The voltage generation circuit of claim 8 wherein the voltage pump circuit develops as the output voltage a pumped output voltage having a value greater than the supply voltage.

10. The voltage generation circuit of claim 8 wherein the voltage sensing circuit decreases a value of the control signal when the reference voltage increases and increases a value of the control signal when the reference voltage decreases.

11. The voltage generation circuit of claim 10 wherein the voltage sensing circuit comprises:

a first transistor having a first signal terminal coupled to the supply voltage and having a second signal terminal and a control terminal coupled to the reference node;

a level shifting circuit having a first terminal coupled to the second signal terminal of the first transistor and having a second signal terminal, the level shifting circuit developing a voltage on the second terminal having a value that s a function of the voltage on the first terminal;

a first current source coupled between the second terminal of the level shifting circuit and a common reference voltage source;

a second transistor having a control terminal coupled to the second terminal of the level shifting circuit and having a first signal terminal coupled to the common

reference voltage source and having a second signal terminal on which the voltage control signal is developed; and

a second current source coupled between the source of the supply voltage and the second signal terminal.

12. The voltage generation circuit of claim 8 wherein the coupling circuit increase the current responsive to a value of the control signal increasing and decreases the current responsive to the value of the control signal decreasing.

13. The voltage generation circuit of claim 12 wherein the coupling circuit comprises:

a level shifting circuit having a first terminal coupled to a source of the supply voltage and having a second terminal, the level shifting circuit developing a voltage on a second terminal having a value that is a function of the supply voltage;

a transistor having a first signal terminal coupled to the reference node and a second signal terminal coupled to the second terminal of the level shifting circuit, the transistor having a control terminal coupled to the voltage sensing circuit to receive the control signal; and

a current source coupled between the reference node and a common voltage reference source.

14. The voltage generation circuit of claim 8 wherein the generator circuit further comprises:

a charge pump circuit that develops a pumped output voltage on an output responsive to a clock signal;

an oscillator circuit coupled to the charge pump, the oscillator developing a clock signal in response to an applied control signal being active and not developing the control signal in response to the applied control signal being inactive;

a feedback circuit coupled to the output of charge pump circuit to receive the pumped output voltage, the feedback circuit developing a pumped voltage having a value that is a function of the pumped output voltage; and

a comparator circuit coupled to the oscillator circuit and having a first input coupled to the feedback circuit to receive the pump feedback voltage and a second input coupled to receive the reference voltage, the comparator circuit applying the active control signal to the oscillator circuit when the pump feedback voltage is less than the reference voltage and applying the inactive control signal to the oscillator when the pump feedback voltage is greater than the reference voltage.

15. A memory device, comprising:

an address bus;

a control bus;

a data bus;

an address decoder coupled to the address bus;

a control circuit coupled to the control bus;

a read/write circuit coupled to the data bus;

a memory-cell array coupled to the address decoder, read/write circuit, and control circuit, the array having a plurality of memory cells arranged in rows and columns, each memory cell storing a bit of data; and

a voltage generation circuit, including,

a generator circuit adapted to receive a supply voltage and including a reference node, the generator circuit developing an output voltage from the supply voltage and the output voltage having a value that is a function of a reference voltage applied on the reference node;

a coupling circuit coupled to the reference node and adapted to receive the supply voltage, the coupling circuit being operable in response to a voltage control

signal to vary an electronic coupling of the supply voltage to the reference node and thereby adjust the value of the reference voltage; and

a voltage sensing circuit coupled to the reference node to receive the reference voltage and coupled to the coupling circuit, the voltage sensing circuit developing the voltage control signal responsive to the reference voltage.

16. The memory device of claim 15 wherein the memory device comprises a dynamic random access memory (DRAM) and the voltage generation circuit generates a pumped voltage VCCP that is applied to various components in the DRAM.

17. The memory device of claim 15 wherein the voltage sensing circuit comprises:

a first transistor having a first signal terminal coupled to source of the supply voltage and having a second signal terminal and a control terminal coupled to the reference node;

a level shifting circuit having a first terminal coupled to the second signal terminal of the first transistor and having a second signal terminal, the level shifting circuit developing a voltage on the second terminal having a value that s a function of the voltage on the first terminal;

a first current source coupled between the second terminal of the level shifting circuit and a common reference voltage source;

a second transistor having a control terminal coupled to the second terminal of the level shifting circuit and having a first signal terminal coupled to the common reference voltage source and having a second signal terminal on which the voltage control signal is developed; and

a second current source coupled between the source of the supply voltage and the second signal terminal.

18. The voltage generation circuit of claim 15 wherein the coupling circuit reduces the electronic coupling of the supply voltage to the reference node responsive to a value of the voltage control signal increasing and increases the electronic coupling of the supply voltage to the reference node responsive to the value of the voltage control signal decreasing.

19. The voltage generation circuit of claim 16 wherein the coupling circuit comprises:

a level shifting circuit having a first terminal coupled to a source of the supply voltage and having a second terminal, the level shifting circuit developing a voltage on a second terminal having a value that is a function of the supply voltage;

a transistor having a first signal terminal coupled to the reference node and a second signal terminal coupled to the second terminal of the level shifting circuit, the transistor having a control terminal coupled to the voltage sensing circuit to receive the voltage control signal; and

a current source coupled between the reference node and a common voltage reference source.

20. A computer system, comprising:

a data input device;

a data output device;

an address bus;

a data bus;

a control bus; and

computing circuitry coupled to the data input and output devices, and the data, address, and control busses, the computing circuitry including a memory device including,

an address bus;

a control bus;

a data bus;

an address decoder coupled to the address bus;

a control circuit coupled to the control bus;

a read/write circuit coupled to the data bus;

a memory-cell array coupled to the address decoder, read/write circuit, and control circuit, the array having a plurality of memory cells arranged in rows and columns, each memory cell storing a bit of data;

a voltage generation circuit, including,

a generator circuit adapted to receive a supply voltage and including a reference node, the generator circuit developing an output voltage from the supply voltage and the output voltage having a value that is a function of a reference voltage applied on the reference node;

a coupling circuit coupled to the reference node and adapted to receive the supply voltage, the coupling circuit being operable in response to a voltage control signal to vary an electronic coupling of the supply voltage to the reference node and thereby adjust the value of the reference voltage; and

a voltage sensing circuit coupled to the reference node to receive the reference voltage and coupled to the coupling circuit, the voltage sensing circuit developing the voltage control signal responsive to the reference voltage.

21. The computer system of claim 20 wherein the memory device comprises a dynamic random access memory (DRAM) and the voltage generation circuit generates a pumped voltage VCCP that is applied to various components in the DRAM.

22. The computer system of claim 20 wherein the voltage sensing circuit comprises:

a first transistor having a first signal terminal coupled to source of the supply voltage and having a second signal terminal and a control terminal coupled to the reference node;

a level shifting circuit having a first terminal coupled to the second signal terminal of the first transistor and having a second signal terminal, the level shifting circuit developing a voltage on the second terminal having a value that s a function of the voltage on the first terminal;

a first current source coupled between the second terminal of the level shifting circuit and a common reference voltage source;

a second transistor having a control terminal coupled to the second terminal of the level shifting circuit and having a first signal terminal coupled to the common reference voltage source and having a second signal terminal on which the voltage control signal is developed; and

a second current source coupled between the source of the supply voltage and the second signal terminal.

23. The computer system of claim 20 wherein the coupling circuit reduces the electronic coupling of the supply voltage to the reference node responsive to a value of the voltage control signal increasing and increases the electronic coupling of the supply voltage to the reference node responsive to the value of the voltage control signal decreasing.

24. The computer system of claim 23 wherein the coupling circuit comprises:

a level shifting circuit having a first terminal coupled to a source of the supply voltage and having a second terminal, the level shifting circuit developing a voltage on a second terminal having a value that is a function of the supply voltage;

a transistor having a first signal terminal coupled to the reference node and a second signal terminal coupled to the second terminal of the level shifting circuit, the transistor having a control terminal coupled to the voltage sensing circuit to receive the voltage control signal; and

a current source coupled between the reference node and a common voltage reference source.

25. A method of controlling a voltage generation circuit that is adapted to receive a supply voltage and includes a reference node, the voltage generation circuit developing an output voltage from the supply voltage and the output voltage having a value that is a function of a reference voltage applied on the reference node, the method comprising:

coupling the supply voltage to the reference node to develop the reference voltage on the reference node, with the amount of coupling determining the value of the reference voltage;

monitoring the value of the reference voltage on the reference node; and

adjusting the coupling of the supply voltage to the reference node responsive to the monitored value of the reference voltage to control the value of the reference voltage and thereby control the generated output voltage.

26. The method of claim 25 wherein coupling the supply voltage to the reference node to develop the reference voltage comprises adjusting a current flowing through a voltage reference circuit to adjust the value of the reference voltage as a function of the current.

27. The method of claim 25 wherein the coupling between the supply voltage and the reference node comprises adjusting a voltage-controlled device coupled between a source of the supply voltage and the reference node.

28. A method of controlling an output voltage that is derived from a supply voltage, the value of the output voltage being a function of a reference voltage that is also derived from the supply voltage, the method comprising monitoring the value of the reference voltage and adjusting the value of the reference voltage in response to the monitored value to control the output voltage.

29. The method of claim 28 wherein the reference voltage is developed on a reference node and wherein adjusting the value of the reference voltage comprises adjusting a

coupling between the supply voltage the reference node to control the value of the reference voltage.

30. The method of claim 29 wherein the coupling between the supply voltage and the reference node comprises adjusting a voltage-controlled device coupled between a source of the supply voltage and the reference node.